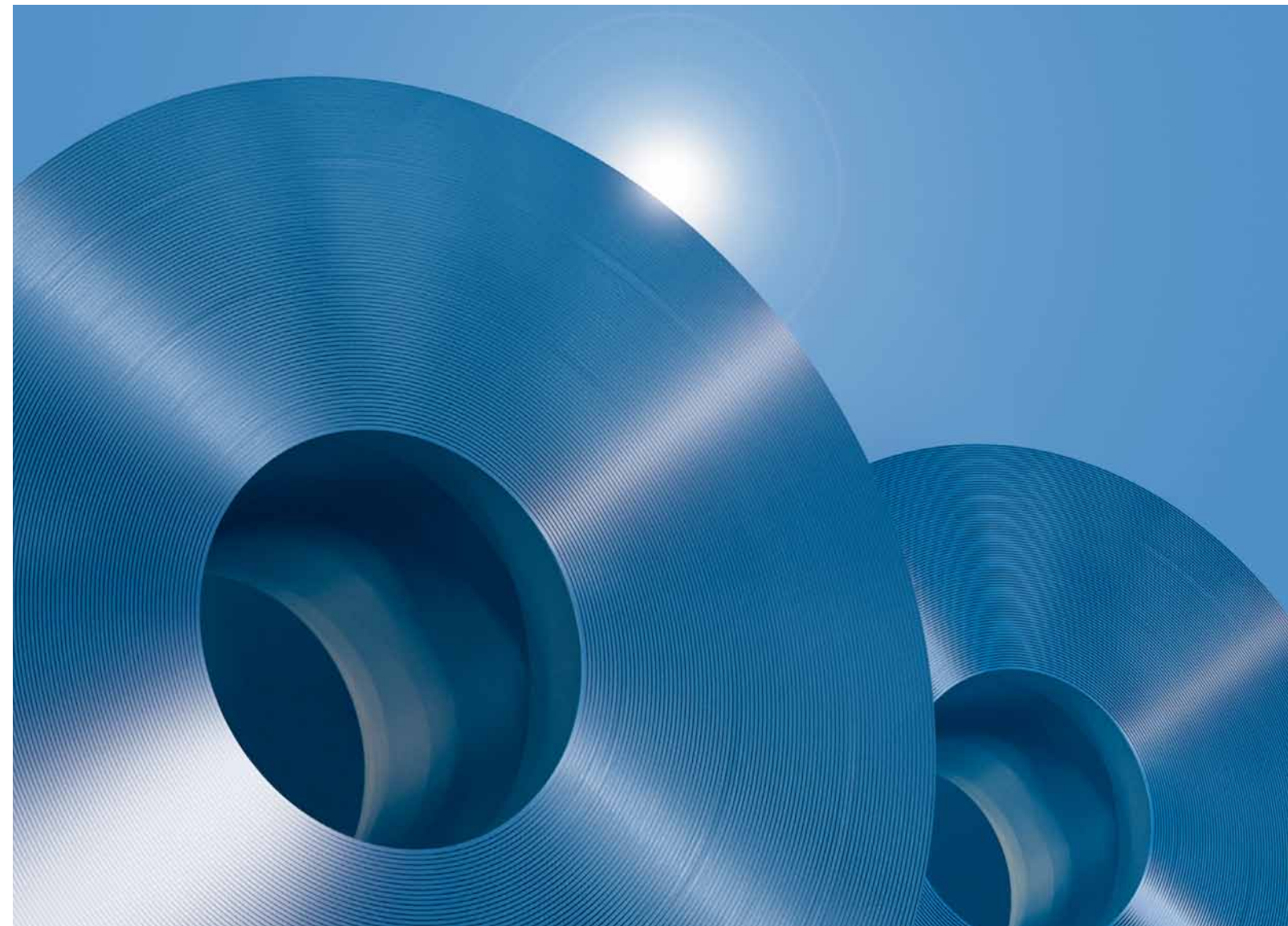


Cold-Rolled Steel Sheets and Coils

NIPPON STEEL & SUMITOMO METAL

<http://www.nssmc.com/>



Introduction

Nippon Steel & Sumitomo Metal manufactures a wide range of Cold-Rolled Steel Sheets and Coils in accordance with Japanese Industrial Standards (JIS), the standards of other countries, and our own strict standards.

Cold-Rolled Steel Sheets and Coils are extensively used as basic materials in automobiles, electrical appliances, steel office equipment, various types of containers, and numerous other products closely connected to our daily lives.

As more sophisticated products are demanded which are more economical, in a wider range of uses that also offer more advanced technology, the quality and performance required of Cold-Rolled Steel Sheets and Coils have become more refined and diversified. We at Nippon Steel & Sumitomo Metal have has been dedicated to the development of new products and quality enhancement to meet our customers’ increasingly sophisticated demands with our rich experience, time honored technology, and excellent manufacturing equipment.

We develop and offer a wide range of steel products from processing steel with superb press formability to high-strength steel sheets instrumental in weight reduction, to name a few, in order to meet our customers’ needs. Nippon Steel & Sumitomo Metal sincerely wishes to help our customers succeed in enhancing business performance with the Cold-Rolled Steel Sheets and Coils that best suit their needs and uses.

Nippon Steel & Sumitomo Metal is committed to providing Cold-Rolled Steel Sheets and Coils that satisfy our customers. We appreciate your continued patronage.



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Features

Nippon Steel & Sumitomo Metal manufactures Cold-Rolled Steel Sheets and Coils under integrated control that manages everything from raw materials to finished steel products, utilizing state-of-the-art equipment. The features of our products are as indicated below.

① Wide Range of Varieties

In addition to Cold-Rolled Steel Sheets and Coils for general purposes that meet JIS specifications, Nippon Steel & Sumitomo Metal offers a wide range of product series to support various applications and use requirements. These include processing steel with outstanding press formability, high-strength steel sheets with high formability and strength, and other types.

② Outstanding Quality

Through a system of integrated control that starts from the blast furnaces, Nippon Steel & Sumitomo Metal utilizes rich experience, technology, and state-of-the-art equipment to implement quality control to meet diversified use purposes and conditions.

We offer products free from internal defects, with excellent surface quality and dimensional precision, not to mention the process versatility so critical to mass production, which customers can use with assurance.

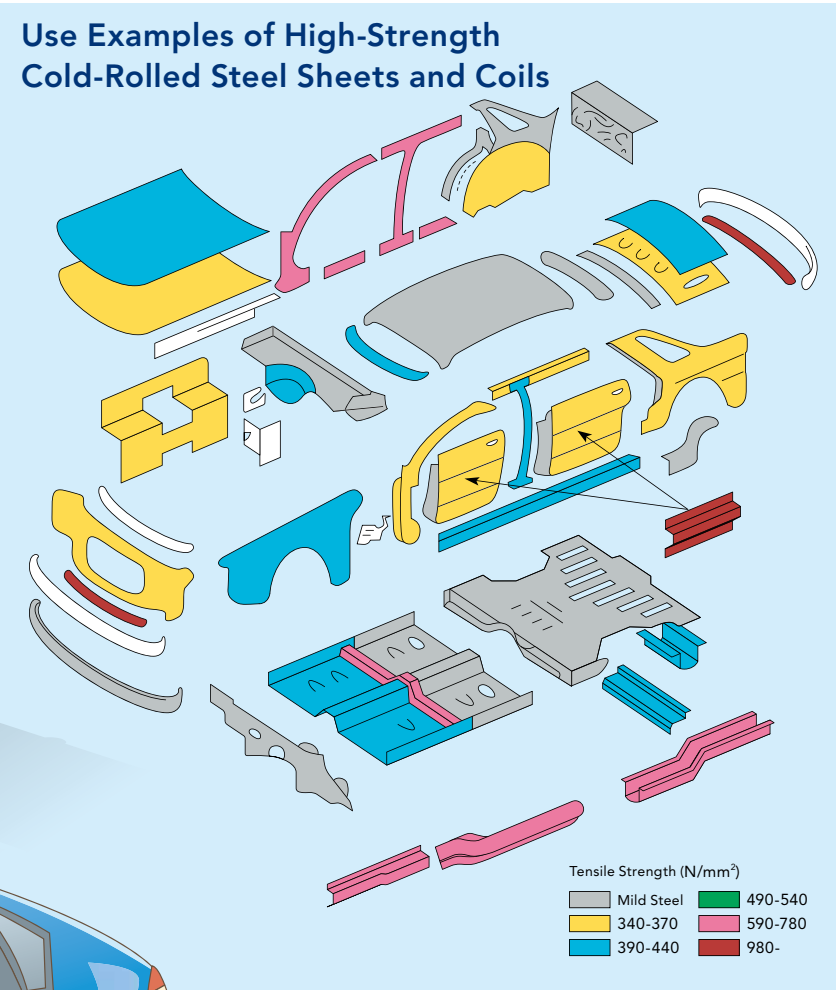
③ Technical Service for Every Need

Drawing upon rich experience and excellent technology that is supported by our robust research and development structure, Nippon Steel & Sumitomo Metal offers complete technical consultation services to satisfy our customers not only for making the most of material properties but also for technical issues related to application processes.

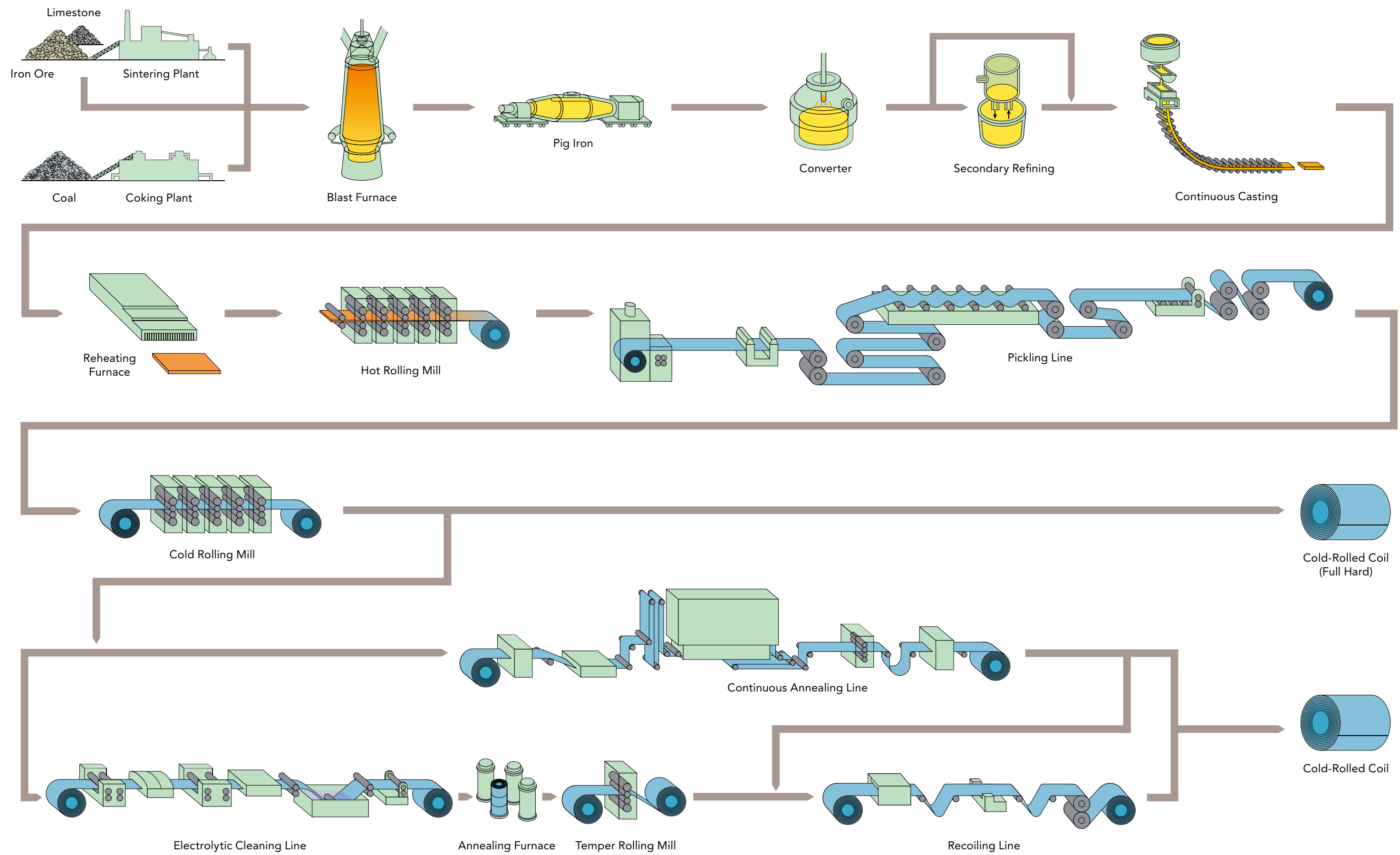
● Works



Examples of Use



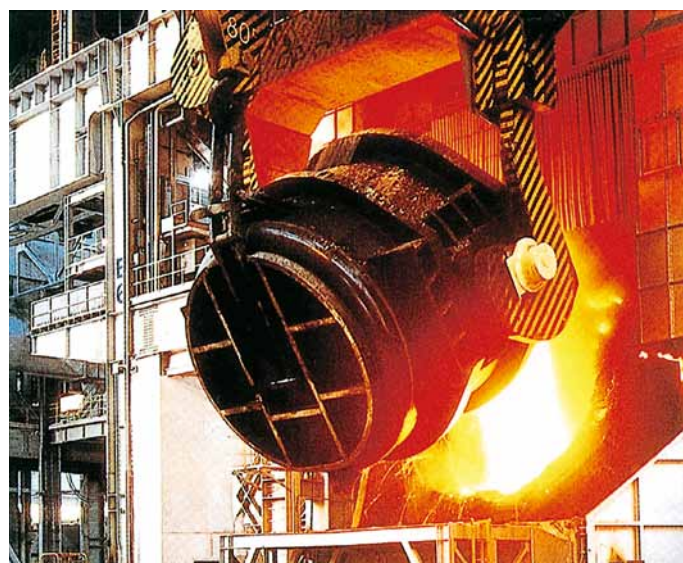
Manufacturing Processes



Manufacturing Equipment

Continuous Casting from Blast Furnace

Pig iron is formed by a chemical reaction of sinter and coke in the blast furnace. Then, in order to meet our customers' demand for ductility and robustness, the pig iron goes through four processes: hot metal pretreatment, converter process, secondary refining process, and continuous casting to remove excess carbons and impurities for chemical adjustment in order to produce an intermediate material known as "slab".



Converter



Hot-Rolling

From Hot-Rolling to Pickling

By strictly controlling the temperature and roll surface condition, stock sheets (or Hot-Rolled Steel Sheets and Coils plates) that are easy to process are produced with flawless surface condition and internal quality. All production line processes, starting from feeding to the reheating furnace to the completion of coiling, are controlled by a computerized system.

The stock sheets or Hot-Rolled Steel Sheets and Coils go through a continuous pickling process, to remove surface scale (iron oxide layer) to make the surface beautiful and flawless in the post process.

From Cold-Rolling to Annealing

Pickled coils are rolled to the specified thickness by cold rolling. The Cold-Rolled Steel Sheets and Coils have their crystal grains enlarged in the rolling direction, making the texture hardened and brittle. In the annealing process, the coils are continuously heated in reductive atmospheric gas to form uniform crystals which meet quality material standards as well as specified requirements and applications.

As there has been greater demand in recent years for a more pristine surface finish, as well as for greater strength and formability, we at Nippon Steel & Sumitomo Metal are offering light, strong, and pristine Cold-Rolled Steel Sheets and Coils that meet those demands. We do so by achieving consistent material quality and reducing surface defects with the use of continuous descaling and cold-rolled steel sheet and coil mills (CDCM).



Cold-Rolling



Annealing

Types of Products

1. General-Purpose Cold-Rolled Steel Sheets and Coils (JIS: G 3141)

Classification	Designation	Characteristics	Main Applications
Commercial Quality	SPCC SPCCT ^{(*)1}	With commercial quality suitable for bending fabrication and simple forming, this is the type in the greatest demand.	Refrigerators, cabinets, power distributing boards and drums
Drawing Quality	SPCD	Steel sheets that provide consistent quality and drawing quality second only to that of SPCE.	Automobile floor and roof panels
Deep-drawing Quality	SPCE SPCF ^{(*)2}	With metallurgically controlled grain size, it retains its beautiful finish even after being deep-drawn.	Automobile fenders and quarter panels
Extra Deep Drawing	SPCG ^{(*)2}	Extra-low carbon Cold-Rolled Steel Sheets and Coils with outstanding workability.	Automobile interior panels and deep drawn parts

^{(*)1} When tension test and elongation values are guaranteed for SPCC in compliance with a customer's request, the suffix T shall be given to the designation: SPCCT.

^{(*)2} Non-aging shall be guaranteed for a period of six months from the date of shipment from the works. Non-aging indicates performance in which stretcher strain does not occur during the working process.

2. Special-Purpose Cold-Rolled Steel Sheets and Coils

❶ Cold-Rolled Steel Sheets and Coils with Workability (Nippon Steel & Sumitomo Metal Standards)

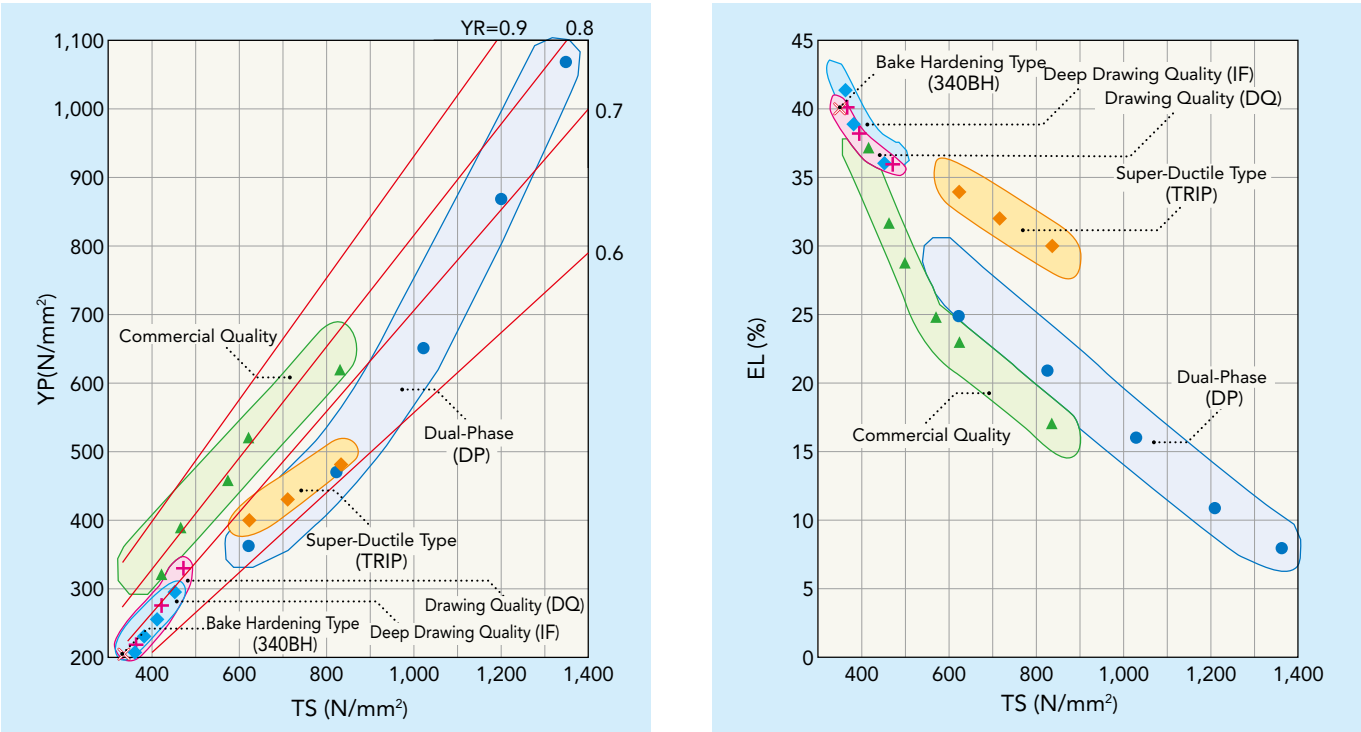
Classification	Designation	Characteristics	Main Applications
Commercial Quality	NSCC	General-purpose Cold-Rolled Steel Sheets and Coils with excellent workability and slow aging.	Automobile doors, hoods, shallow drawn parts
Drawing Quality	NSC270D NSC270E	Workability second only to SPCE.	Automobile side panels, floors, drawn parts
Extra Deep Drawing	NSC270F	Extra-low-carbon Cold-Rolled Steel Sheets and Coils with excellent workability.	Automobile quarter panels
	NSC270G	Extra-low-carbon Cold-Rolled Steel Sheets and Coils with excellent deep-drawing workability.	Automobile oil pans, high roofs, extra deep drawn parts

❷ High-Strength Steel Sheets (Nippon Steel & Sumitomo Metal Standards)

Classification	Designation	Characteristics	Main Applications
Commercial Quality	NSC390N, 440N, 490N, 540N, 590N	Suitable for light forming, such as bending.	Reinforcement, members, pillars bumpers
Drawing Quality	NSC340R, 370R, 390R, 440R	Excellent drawability, suitable for a wide variety of forming.	Pillar side sills and dash boards
Deep Drawing Quality	NSC340E, 370E, 390E, 440E	High r-value, suitable for deep drawing.	Hood outer, door outer, members and dashboards
Bake Hardening Type Drawing Quality	NSC340BH	The yield point is increased by paint baking. Suitable for applications requiring high dent resistance.	Hood outer, door outer and trunk lid outer
Dual-Phase	NSC490D, 540D, 590D, 780D, 980D, 1180D	High strength and low yield point, excellent formability. High impact energy absorbing capability.	Bumpers, door impact bars and members
Super-Ductile Type	NSC590T, 690T, 780T	Very high ductility, excellent balance between strength and ductility, high impact energy absorbing capability.	Members, pillars, side sills, etc.

3. Six Series of High-Strength Cold-Rolled Steel Sheets and Coils

Nippon Steel & Sumitomo Metal's High-Strength Cold-Rolled Steel Sheets and Coils are classified into the following six categories, depending on their forming properties such as strength, ductility, and balance between strength and yield point.



Mass-Production Menu

Classification	Designation	Strength (Figures Indicate the Minimum Tensile Strength in N/mm²)									
		340	370	390	440	490	540	590	690	780	980, 1,180
Commercial Quality	NSC***N			○	○	○	○	○			
Drawing Quality	NSC***R	○	○	○	○						
Deep Drawing Quality	NSC***E	○	○	○	○						
Bake Hardening Type Drawing Quality	NSC***BH	○									
Dual-Phase	NSC***D					○	○	○		○	○
Super-Ductile Type	NSC***T							○	○	○	

The strength level is put in "****" of the specification code.

Representative Examples of Properties

Designation	Yield Point (N/mm²)	Tensile Strength (N/mm²)	Elongation (%)	Yield Ratio (%)	Thickness (mm)	Tensile Test Piece
NSC440R	290	459	37	63	1.6	JIS No.5 longitudinal to rolling direction
NSC440E	284	448	39	63	1.6	
NSC340BH	201	347	44	58	0.8	
NSC590D	318	610	31	52	1.6	
NSC780D	437	829	22	53	1.6	
NSC980D (TYPE A)	630	1,006	17	63	1.6	
NSC980D (TYPE B)	716	1,015	15	71	1.6	
NSC1180D	900	1,199	11	75	1.6	
NSC590T	391	618	37	63	1.6	

Standards

1. Mechanical Properties

Type	Classification	Test <div>Classification According to Nominal Thickness (mm) Tempering Symbol</div>		Tension Test														Bending Test*4			
				Yield Point or Yield Strength (N / mm ²)	Tensile Strength (N / mm ²)	Elongation Minimum (%)						Average Plasticity Strain Ratio (\bar{r})				Sampling Direction of Test Specimen	Bending Angle	Inner Radius	Sampling Direction of Test Specimen		
		Designation	0.25 ≤ t	0.25 ≤ t	0.25 ≤ t < 0.30	0.30 ≤ t < 0.40	0.40 ≤ t < 0.60		0.60 ≤ t < 1.0	1.0 ≤ t < 1.6	1.6 ≤ t < 2.5	2.5 ≤ t	t < 0.50	0.50 ≤ t ≤ 1.0	1.0 < t ≤ 1.6	1.6 < t					
Standard Cold-Rolled Steel Sheets and Coils*1 (JIS G 3141)	Commercial Quality	SPCC	S, 8, 4, 2, 1	—	—	—	—	—	—	—	—	—	—	—	—	—	—	JIS No.5 rolling direction	180°	Tight bending	JIS No.3 rolling direction
		SPCCT	S	—	270 ≤	28 ≤	31 ≤	34 ≤		36 ≤	37 ≤	38 ≤	39 ≤	—	—	—	—				
	Drawing Quality	SPCD	S	(≤ 240)	270 ≤	30 ≤	33 ≤	36 ≤		38 ≤	39 ≤	40 ≤	41 ≤	—	—	—	—		—	—	—
		Deep Drawing Quality	SPCE	S	(≤ 220)	270 ≤	32 ≤	35 ≤	38 ≤		40 ≤	41 ≤	42 ≤	43 ≤	—	—	—				
			SPCF	S	(≤ 210)	270 ≤	—	—	40 ≤		42 ≤	43 ≤	44 ≤	45 ≤	—	—	—				
	Extra-Deep Drawing Quality	SPCG	S	(≤ 190)	270 ≤	—	—	42 ≤		44 ≤	45 ≤	46 ≤	—	—	1.4 ≤	1.3 ≤	—				

Type	Classification	Test <div>Classification According to Nominal Thickness (mm) Tempering Symbol</div>		Tension Test													Bending Test*4			
				Yield Point or Yield Strength (N/mm ²)	Tensile Strength (N/mm ²)	Elongation Minimum (%)						Average Plasticity Strain Ratio (\bar{r})				Sampling Direction of Test Specimen	Bending Angle	Inner Radius	Sampling Direction of Test Specimen	
		Designation	0.25 ≤ t	0.25 ≤ t	0.25 ≤ t < 0.30	0.30 ≤ t < 0.40	0.40 ≤ t < 0.60		0.60 ≤ t < 1.0	1.0 ≤ t < 1.6	1.6 ≤ t < 2.3	2.3 ≤ t	0.4 ≤ t ≤ 1.0	1.0 < t ≤ 1.6	1.6 < t					
Steel Sheets with Workability *2 (Nippon Steel & Sumitomo Metal Standards)	Drawing Quality	NSC270D	S	(≤ 195)	270 ≤	—	—	34 ≤		36 ≤	37 ≤	38 ≤	39 ≤	—	—	—	JIS No.5 rolling direction	—	—	—
		NSC270E	S	(≤ 185)	270 ≤	—	—	36 ≤		38 ≤	39 ≤	40 ≤	41 ≤	1.4 ≤	1.3 ≤	—				
	Deep Drawing Quality	NSC270F	S	(≤ 175)	250 ≤	—	—	—		45 ≤	46 ≤	47 ≤	48 ≤	1.6 ≤	1.5 ≤	—				
		NSC270G	S	(≤ 175)	270 ≤	—	—	—		47 ≤	48 ≤	49 ≤	50 ≤	1.7 ≤	1.6 ≤	—				
	Drawing Quality (BAF)	NSC270D-BA	S	(≤ 240)	270 ≤	32 ≤	33 ≤	34 ≤		36 ≤	37 ≤	38 ≤	39 ≤	—	—	—	JIS No.5 rolling direction	—	—	—
	Deep Drawing Quality (BAF)	NSC270E-BA	S	(≤ 220)	270 ≤	34 ≤	35 ≤	36 ≤		38 ≤	39 ≤	40 ≤	41 ≤	—	—	—				

Type	Classification	Test		Tension Test										Sampling Direction of Test Specimen	Bending Test**			Bake Hardenability (N/mm ²)
				Yield Point or 0.2% Proof Stress (N / mm ²)	Tensile Strength (N / mm ²)	Elongation (%)					Bending Angle	Inner Radius	Sampling Direction of Test Specimen					
		Designation	Tempering Symbol	—	—	0.40 ≤ t < 0.60	0.60 ≤ t < 0.80	0.80 ≤ t < 1.00	—	1.00 ≤ t < 1.20	1.20 ≤ t < 1.60	1.60 ≤ t < 2.00	2.00 ≤ t ≤ 2.30		—	—	—	
High-Strength Cold-Rolled Steel Sheet and Coils * ³ (Nippon Steel & Sumitomo Metal Standards)	Commercial Quality	NSC390N	S	235 ≤	390 ≤	28 ≤	30 ≤	30 ≤		31 ≤	31 ≤	32 ≤	33 ≤	JIS No.5 longitudinal to rolling direction	180°	Tight bending	JIS No.3 longitudinal to rolling direction	
		NSC440N	S	275 ≤	440 ≤	24 ≤	26 ≤	26 ≤		27 ≤	27 ≤	28 ≤	29 ≤					
		NSC490N	S	315 ≤	490 ≤	—	23 ≤	23 ≤		24 ≤	24 ≤	24 ≤	25 ≤			0.5 times thickness		
		NSC540N	S	355 ≤	540 ≤	—	20 ≤	20 ≤		21 ≤	21 ≤	21 ≤	22 ≤					
		NSC590N	S	390 ≤	590 ≤	—	17 ≤	17 ≤		18 ≤	18 ≤	18 ≤	19 ≤					
	Drawing Quality	NSC340R	S	185 ≤	340 ≤	32 ≤	34 ≤	35 ≤		36 ≤	37 ≤	38 ≤	39 ≤		180°	Tight bending		
		NSC370R	S	205 ≤	370 ≤	31 ≤	33 ≤	34 ≤		35 ≤	36 ≤	37 ≤	38 ≤					
		NSC390R	S	225 ≤	390 ≤	29 ≤	31 ≤	32 ≤		33 ≤	34 ≤	35 ≤	36 ≤					
		NSC440R	S	265 ≤	440 ≤	27 ≤	29 ≤	30 ≤		30 ≤	31 ≤	31 ≤	32 ≤					
	Deep Drawing Quality	NSC340E	S	165 ≤	340 ≤	—	34 ≤	35 ≤		36 ≤	37 ≤	38 ≤	39 ≤		180°	Tight bending		
		NSC370E	S	205 ≤	370 ≤	—	33 ≤	34 ≤		35 ≤	36 ≤	37 ≤	38 ≤					
		NSC390E	S	205 ≤	390 ≤	—	31 ≤	32 ≤		33 ≤	34 ≤	35 ≤	36 ≤					
		NSC440E	S	245 ≤	440 ≤	—	29 ≤	30 ≤		30 ≤	31 ≤	32 ≤	33 ≤					
	Bake Hardened Type Drawing Quality	NSC340BH	S	195 ≤	340 ≤	32 ≤	35 ≤	35 ≤		36 ≤	37 ≤	38 ≤	39 ≤	180°	Tight bending			
	Dual-Phase	NSC490D	S	≤ 335	490 ≤	—	27 ≤	28 ≤		28 ≤	29 ≤	29 ≤	29 ≤					
		NSC540D	S	≤ 375	540 ≤	—	25 ≤	26 ≤		26 ≤	27 ≤	27 ≤	27 ≤					
		NSC590D	S	≤ 410	590 ≤	—	17 ≤	18 ≤		19 ≤	20 ≤	21 ≤	21 ≤					
		NSC780D	S	≤ 645	780 ≤	—	—	13 ≤		14 ≤	15 ≤	16 ≤	16 ≤					
		NSC980D	S	≤ 885	980 ≤	—	—	9 ≤		10 ≤	11 ≤	12 ≤	12 ≤					
		NSC1180D	S	(≤ 1,130)	1,180 ≤	—	—	6 ≤		6 ≤	7 ≤	8 ≤	8 ≤					
	Super-Extra Ductile Type	NSC590T	S	≤ 480	590 ≤	—	25 ≤	26 ≤		27 ≤	28 ≤	29 ≤	30 ≤					
		NSC690T	S	≤ 520	690 ≤	—	22 ≤	23 ≤		24 ≤	25 ≤	26 ≤	27 ≤					
		NSC780T	S	≤ 570	780 ≤	—	—	19 ≤		19 ≤	20 ≤	20 ≤	21 ≤					

Specific Hardness (Standard Tempering, 1/8, 1/4, 1/2, Full Hardness)

Tempering Classification	Symbol	HrB	HV	Bending Angle ^{*4}	Inner Diameter ^{*4}	Test Piece ^{*4}
Standard Tempering	S	—	—	180°	Tight bending	No. 3 rolling direction
1/8 Hardness	8	50–71	95–130	180°	Tight bending	No. 3 rolling direction
1/4 Hardness	4	65–80	115–150	180°	0.5 times thickness	No. 3 rolling direction
1/2 Hardness	2	74–89	135–185	180°	1.0 times thickness	No. 3 rolling direction
Hardness	1	85 ≤	170 ≤	—	—	No. 3 rolling direction

Rockwell or Vickers hardness shall be employed.

^{*1)} 1 In principle, tension values shall not apply to SPCC.
2 When tension test and elongation values are guaranteed for SPCC in compliance with a customer's request, the suffix T shall be given to the designation: SPCCT.
3 For sheets under 0.6mm thick, ordinarily, tension tests shall be omitted.
4 This table shall apply to sheets 30mm wide or over.
5 SPCF and SPCG shall be guaranteed for non-aging property for a period of 6 months from the shipment from the works.
6 The upper limit values in parentheses () of yield point or yield strength are reference values and may be applied in accordance with agreements to be signed between both parties to deliveries.
7 This table does not apply to steel sheet or coil to which a bright finish has been applied.

^{*2)} The yield point values in the parentheses indicate the target values.
^{*3)} The bake hardenability (BH) indicates an increase in yield point after 2%-pre-stain and heat treatment at 170°C for 20 minutes.
^{*4)} The bending test shall not be conducted unless otherwise specified.

Standards

2. Size Tolerances
(JIS G 3141 Standards)

Tolerances on thickness, length, and width are usually in accordance with Table A. When tolerances stricter than those in Table A are specified, the tolerances will comply with Table B.

①Tolerance on thickness

The position for measuring thickness is the normal position for coil, and for steel sheet it is 15 mm in from both edges. In the case of a width less than 30 mm, the position is the center of the width.

Thickness Tolerances Table A

(Unit: mm)					
Nominal Thickness \ Nominal Width	W < 630	630 ≤ W < 1,000	1,000 ≤ W < 1,250	1,250 ≤ W < 1,600	1,600 ≤ W
t < 0.25	± 0.03	± 0.03	± 0.03	(± 0.05)	(± 0.06)
0.25 ≤ t < 0.40	± 0.04	± 0.04	± 0.04	(± 0.06)	(± 0.07)
0.40 ≤ t < 0.60	± 0.05	± 0.05	± 0.05	± 0.06	(± 0.07)
0.60 ≤ t < 0.80	± 0.06	± 0.06	± 0.06	± 0.06	± 0.07
0.80 ≤ t < 1.00	± 0.06	± 0.06	± 0.07	± 0.08	± 0.09
1.00 ≤ t < 1.25	± 0.07	± 0.07	± 0.08	± 0.09	± 0.11
1.25 ≤ t < 1.60	± 0.08	± 0.09	± 0.10	± 0.11	± 0.13
1.60 ≤ t < 2.00	± 0.10	± 0.11	± 0.12	± 0.13	± 0.15
2.00 ≤ t < 2.50	± 0.12	± 0.13	± 0.14	± 0.15	± 0.17
2.50 ≤ t < 3.15	± 0.14	± 0.15	± 0.16	± 0.17	± 0.20
3.15 ≤ t	± 0.16	± 0.17	± 0.19	± 0.20	(± 0.22)

() : Not specified in JIS

Thickness Tolerances Table B

(Unit: mm)				
Nominal Thickness \ Nominal Width	W < 160	160 ≤ W < 250	250 ≤ W < 400	400 ≤ W < 630
t < 0.10	± 0.010	± 0.020	—	—
0.10 ≤ t < 0.16	± 0.015	± 0.020	—	—
0.16 ≤ t < 0.25	± 0.020	± 0.025	± 0.030	± 0.030
0.25 ≤ t < 0.40	± 0.025	± 0.030	± 0.035	± 0.035
0.40 ≤ t < 0.60	± 0.035	± 0.040	± 0.040	± 0.040
0.60 ≤ t < 0.80	± 0.040	± 0.045	± 0.045	± 0.045
0.80 ≤ t < 1.00	± 0.04	± 0.05	± 0.05	± 0.05
1.00 ≤ t < 1.25	± 0.05	± 0.05	± 0.05	± 0.06
1.25 ≤ t < 1.60	± 0.05	± 0.06	± 0.06	± 0.06
1.60 ≤ t < 2.00	± 0.06	± 0.07	± 0.08	± 0.08
2.00 ≤ t < 2.50	± 0.07	± 0.08	± 0.08	± 0.09
2.50 ≤ t < 3.15	± 0.08	± 0.09	± 0.09	± 0.10
3.15 ≤ t	± 0.09	± 0.10	± 0.10	± 0.11

②Width Tolerances

The position for measuring width is the normal position for coil, and the arbitrary position for steel sheets.

Thickness Tolerances Table C

(Unit: mm)				
Nominal Thickness \ Nominal Width	W < 160	160 ≤ W < 250	250 ≤ W < 400	400 ≤ W < 630
t < 0.60	± 0.15	± 0.20	± 0.25	± 0.30
0.60 ≤ t < 1.00	± 0.20	± 0.25	± 0.25	± 0.30
1.00 ≤ t < 1.60	± 0.20	± 0.30	± 0.30	± 0.40
1.60 ≤ t < 2.50	± 0.25	± 0.35	± 0.40	± 0.50
2.50 ≤ t < 4.00	± 0.30	± 0.40	± 0.45	± 0.50
4.00 ≤ t < 5.00	± 0.40	± 0.50	± 0.55	± 0.65

3. Shapes
(JIS G 3141 Standards)

①Flatness

The specifications shall apply to Cold-Rolled Steel Sheets and Coils 500mm or more in width of standard temper grade. Unless otherwise specified, Flatness A shall apply.

Kind of Strain \ Nominal Thickness	Flatness A			Flatness B		
	Bow	Edge Wavy	Center Buckle	Bow	Edge Wavy	Center Buckle
W < 1,000	12	8	6	2	2	2
1,000 ≤ W < 1,250	15	9	8	3	2	2
1,250 ≤ W < 1,600	15	11	8	4	3	2
1,600 ≤ W	20	13	9	5	4	2

(Unit: mm)

②Camber

(Unit: mm)		
Nominal Thickness \ Nominal Width	Maximum Values of Camber A	Maximum Values of Camber B
	Steel Strip	Steel Strip
30 ≤ W < 40	8 per any length of 2,000	25 per any length of 2,000
40 ≤ W < 630	4 per any length of 2,000	10 per any length of 2,000
630 ≤ W	2 per any length of 2,000	

The table does not apply to the abnormal part of a steel strip.

4. Tempering and Surface Finish

①Tempering Classification

Cold-Rolled Steel Sheets and Coils with standard tempering are mainly produced. For those other than standard tempering, please consult us.

Standard Cold-Rolled Steel Sheets and Coils JIS G 3141

Tempering Classification	Symbol
Standard Tempering	S
1/8 Hardness	8
1/4 Hardness	4
1/2 Hardness	2
Full Hardness	1

Nippon Steel & Sumitomo Metal Standards

Tempering Classification	Symbol
Standard Tempering	S
Not Annealed	M

②Surface Finish

Two surface finishes are available – dull and bright. Dull-finish products are mainly produced. For bright-finish products, please consult us.

Dull Finish	Bright Finish
A dull or matte finish is produced by a minute roughening of the steel surface. The merits of a dull finish are: a. Facilitates drawing, because the matte surface holds the lubricant evenly. b. Better paint adhesion Paint adhesion is excellent due to the minute roughness of the sheet surfaces, which results in improved paint durability.	Bright finishes are applied to the steel by the use of smoothly polished rolls. The sheet surfaces are outstandingly smooth, processed with a mirror-like luster. Accordingly, these bright finishes are ideal for decorative plating.

5. Chemical Composition Values
(JIS G 3141 Standards)

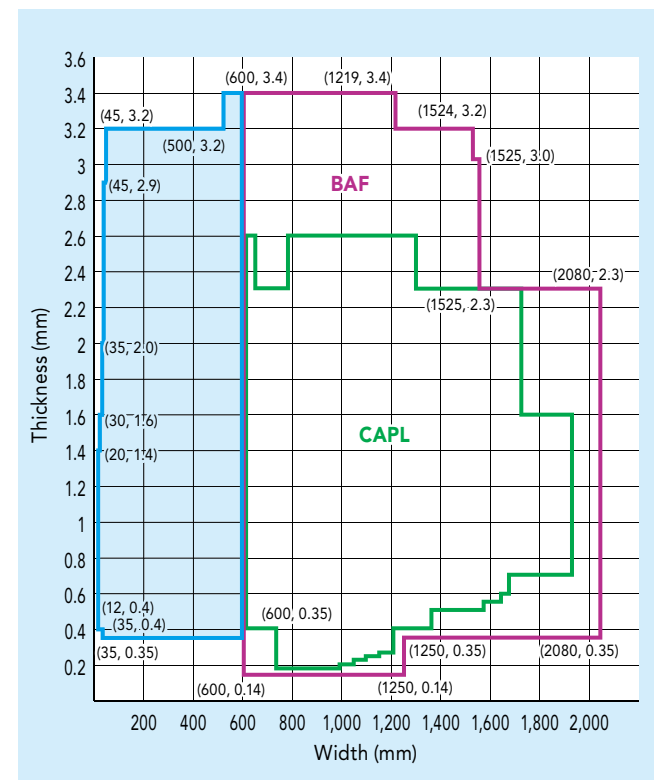
Chemical composition values are defined as follows.

Designation	C	Mn	P	S
SPCC	≤ 0.15	≤ 0.60	≤ 0.100	≤ 0.035
SPCD	≤ 0.10	≤ 0.50	≤ 0.040	≤ 0.035
SPCE	≤ 0.08	≤ 0.45	≤ 0.030	≤ 0.030
SPCF	≤ 0.06	≤ 0.45	≤ 0.030	≤ 0.030
SPCG (*)	≤ 0.02	≤ 0.25	≤ 0.020	≤ 0.020

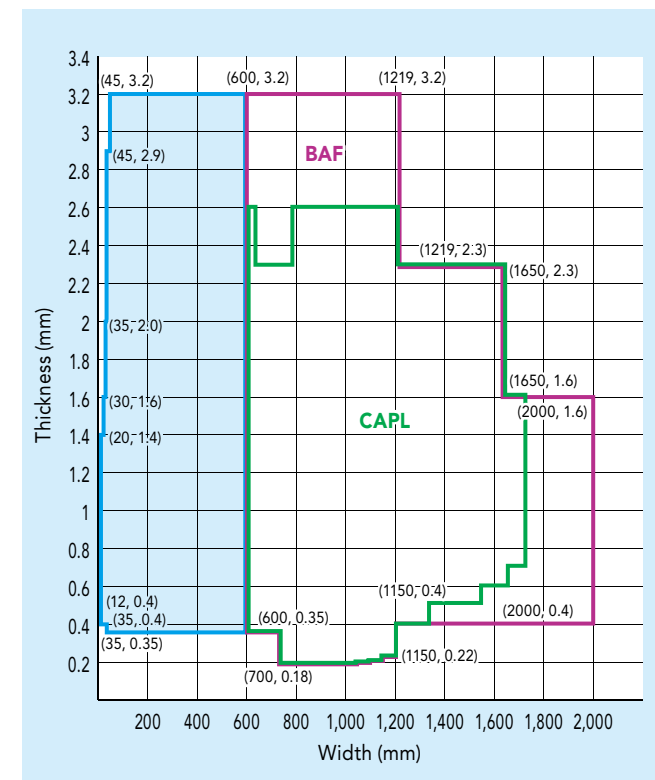
(Unit: mm)

Alloying elements other than those listed in the table may be added as need arises.
(*) The maximum value for Mn, P or S may be changed according to agreements between both parties to deliveries.
(Applied to sheets and coils as-annealed and with standard tempering.)

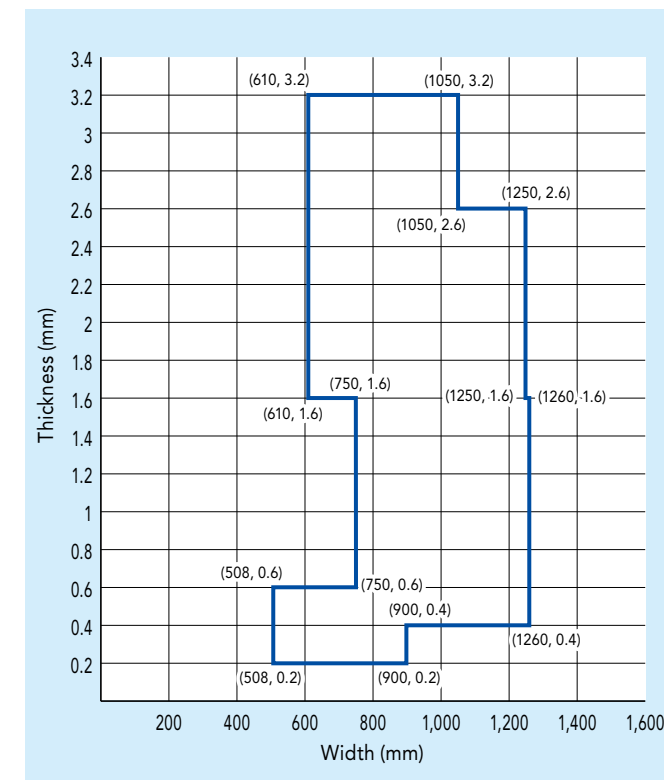
- **SPCC-SD**



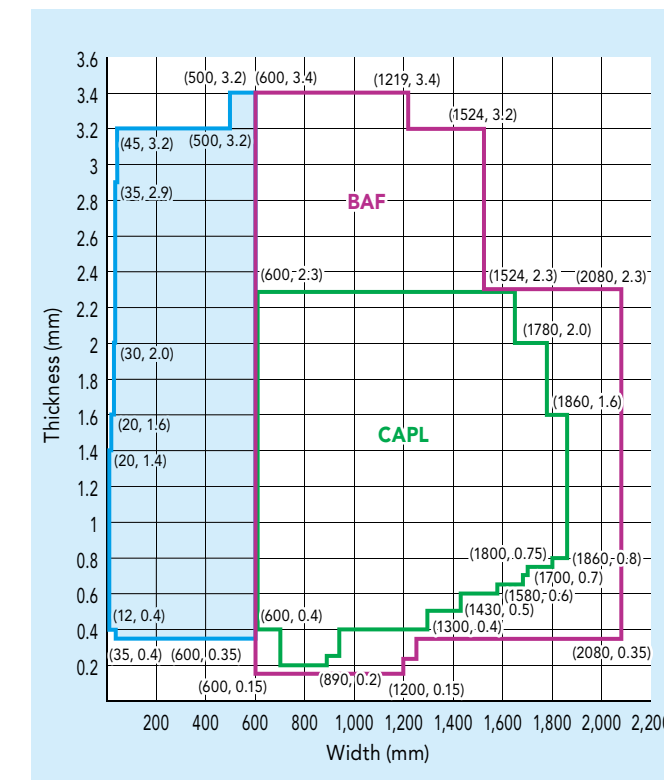
●SPCC-8D



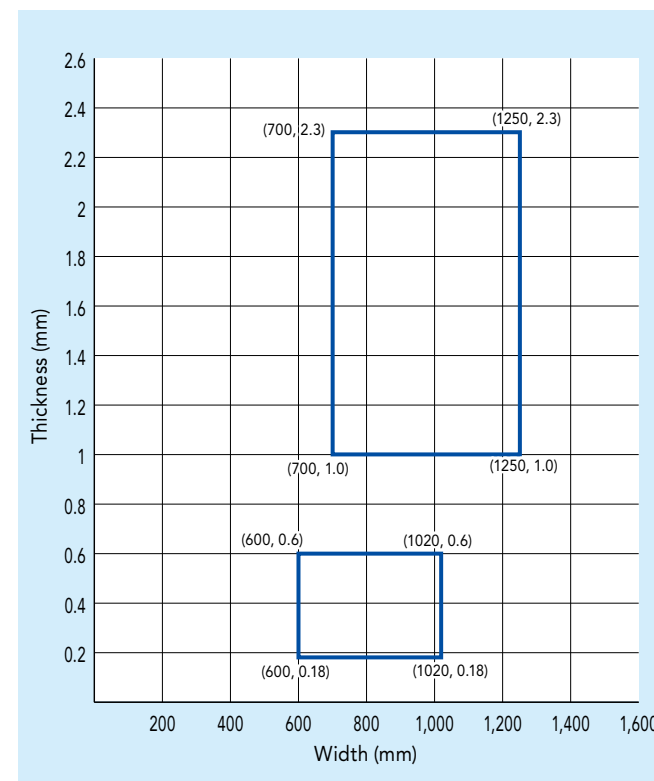
● **SPCC-2D**



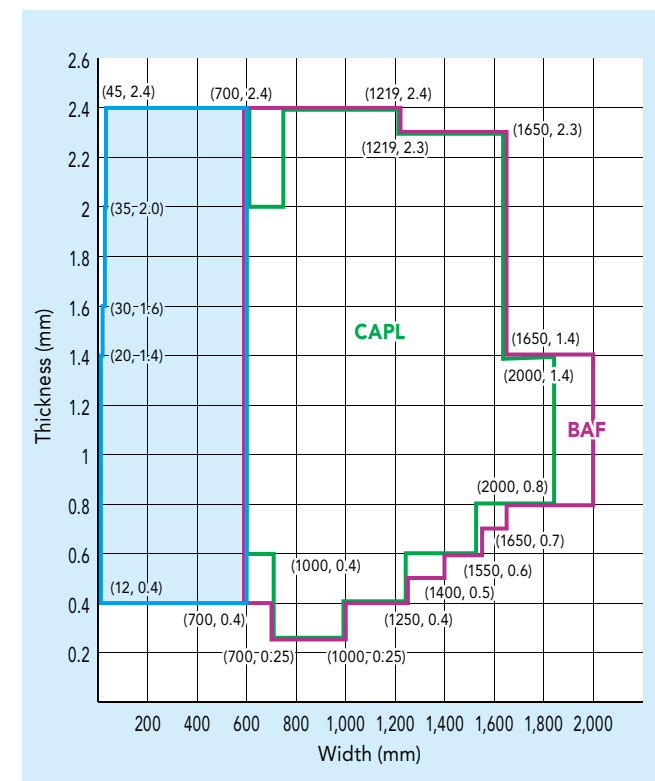
●SPCD-SD SPCE-SD



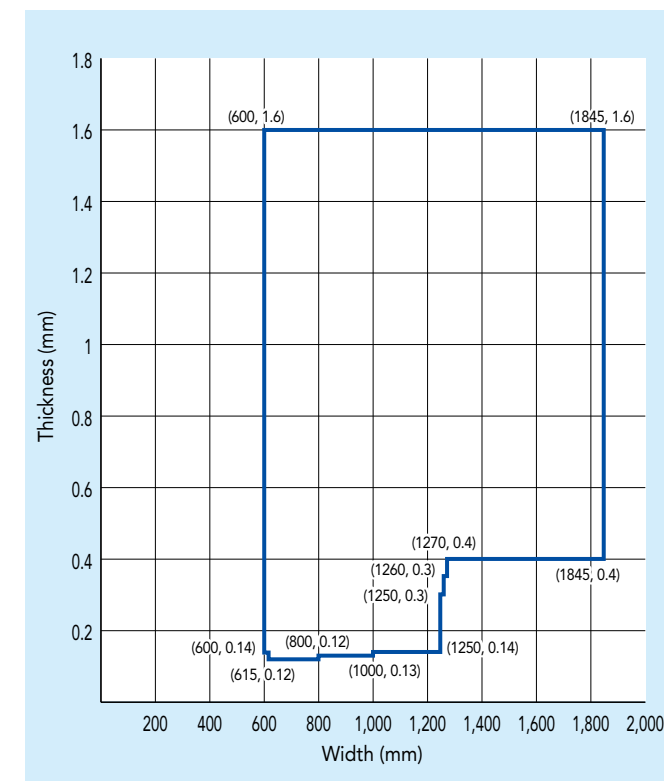
●SPCC-SB



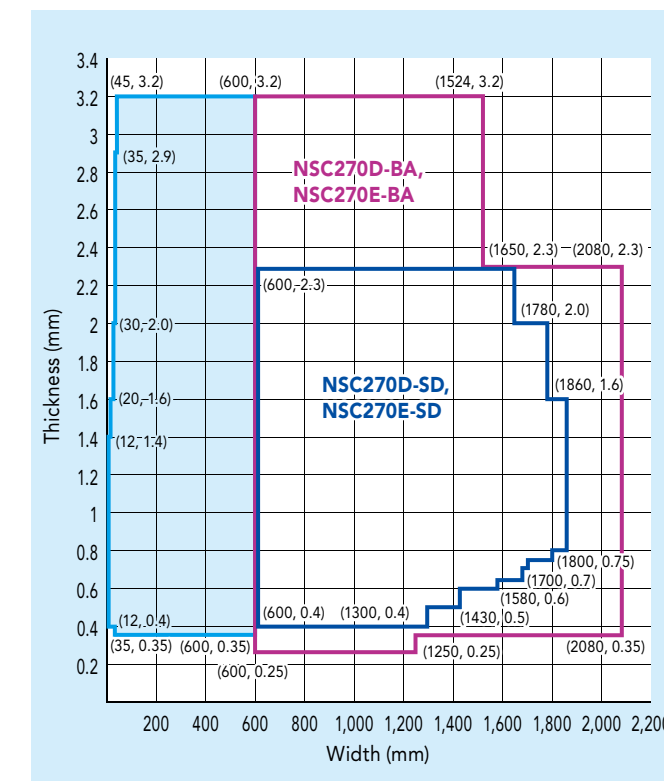
●SPCC-4D



●SPCC-1D

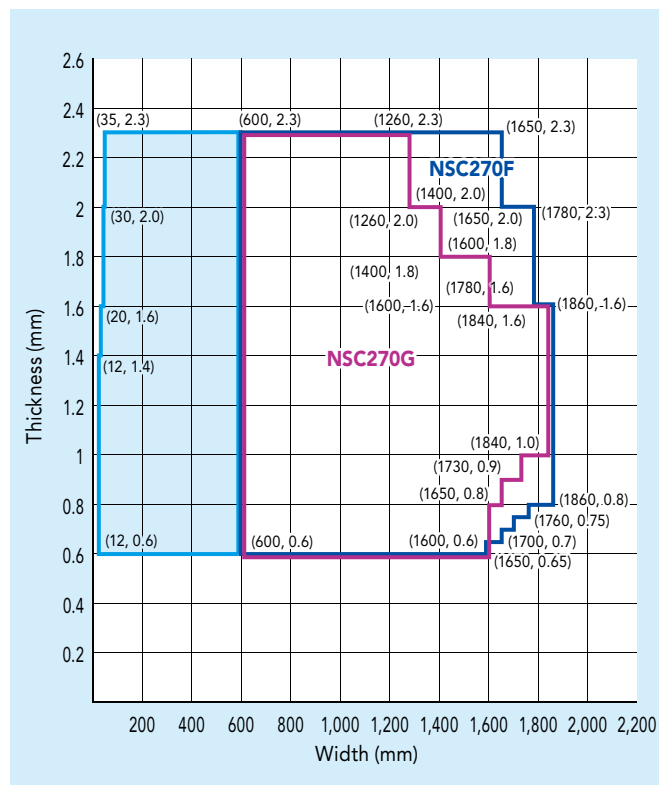


● NSC270D-SD NSC270E-SD
NSC270D-BA NSC270E-BA

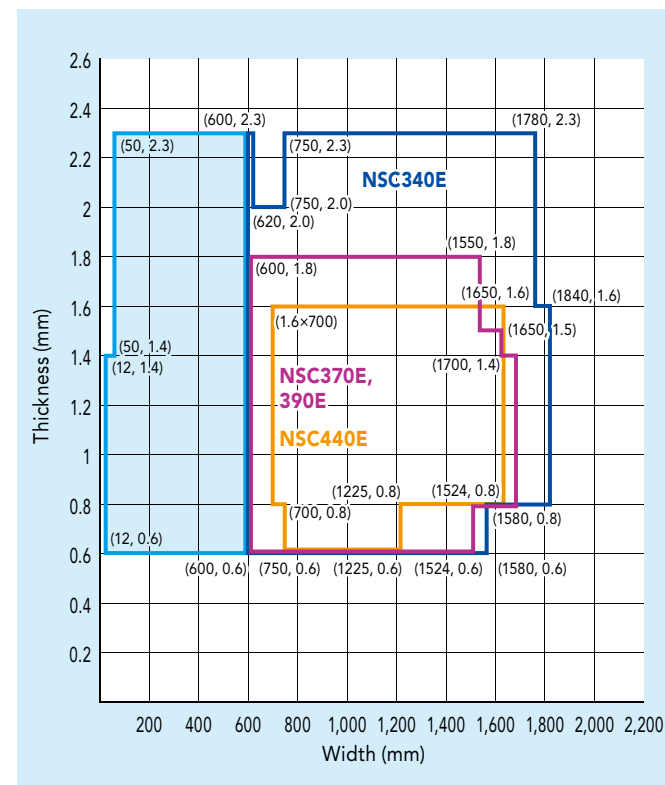


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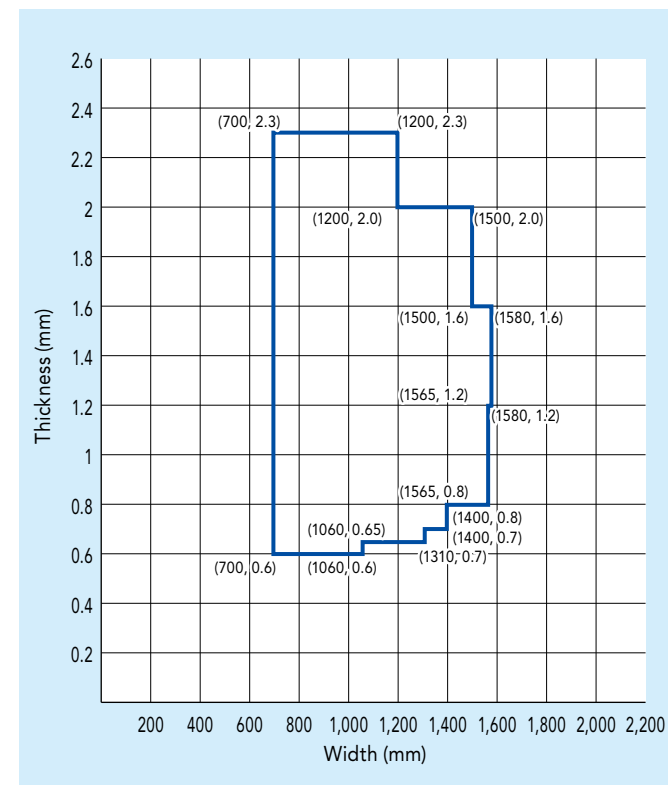
●NSC270F NSC270G



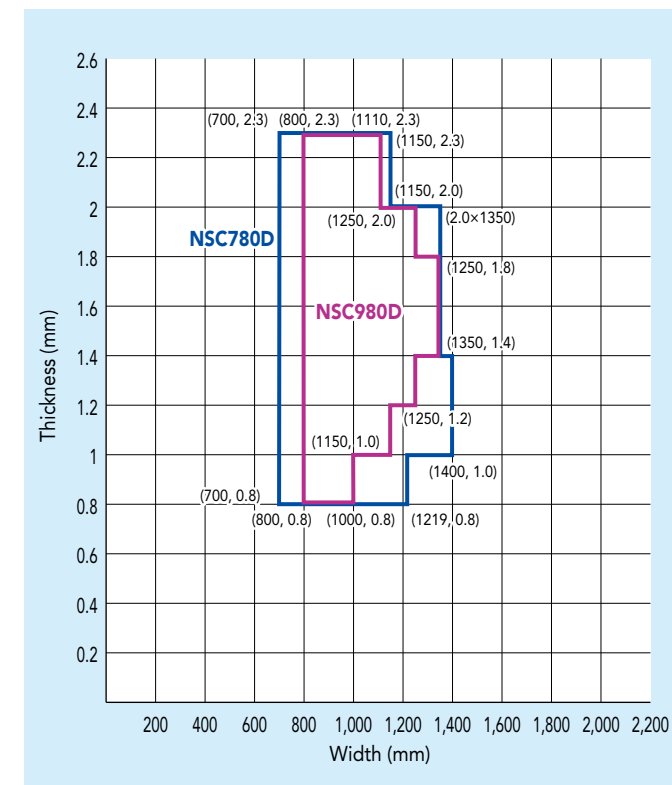
●NSC340E NSC370E NSC390E NSC440E



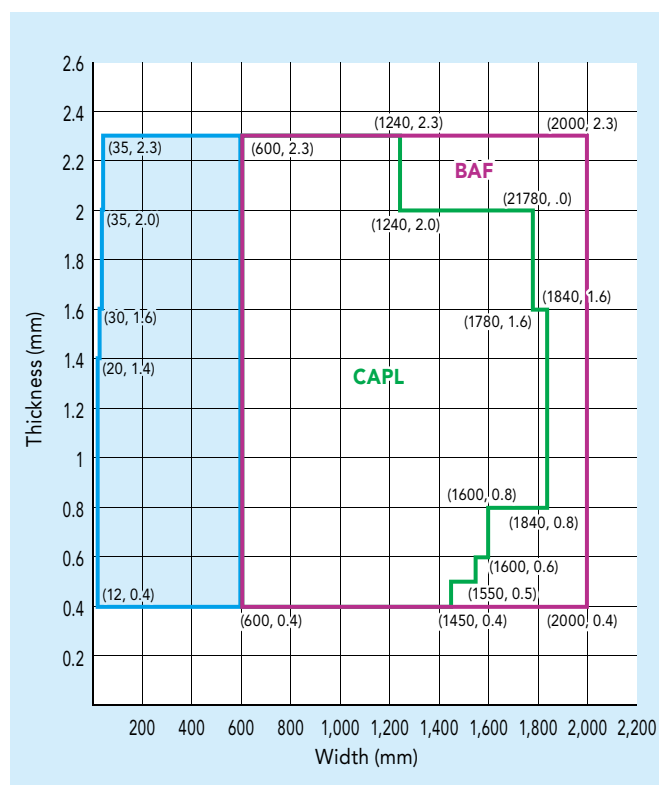
●NSC540N NSC590N



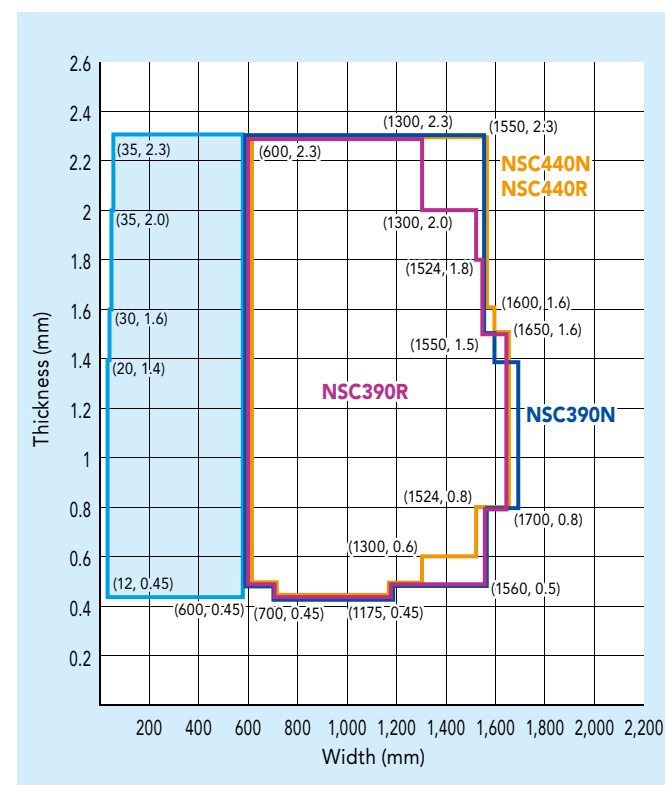
●NSC780D NSC980D



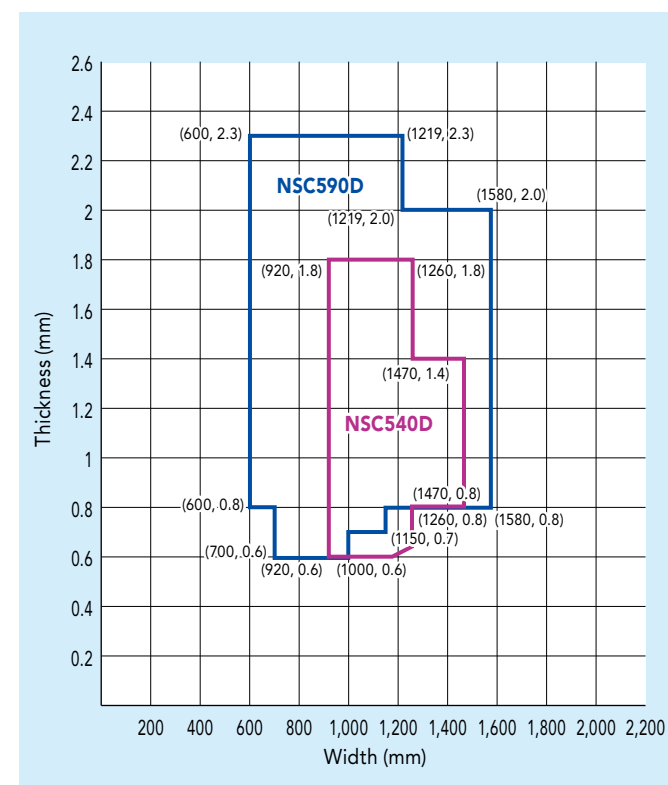
●NSC340R NSC370R NSC340BH



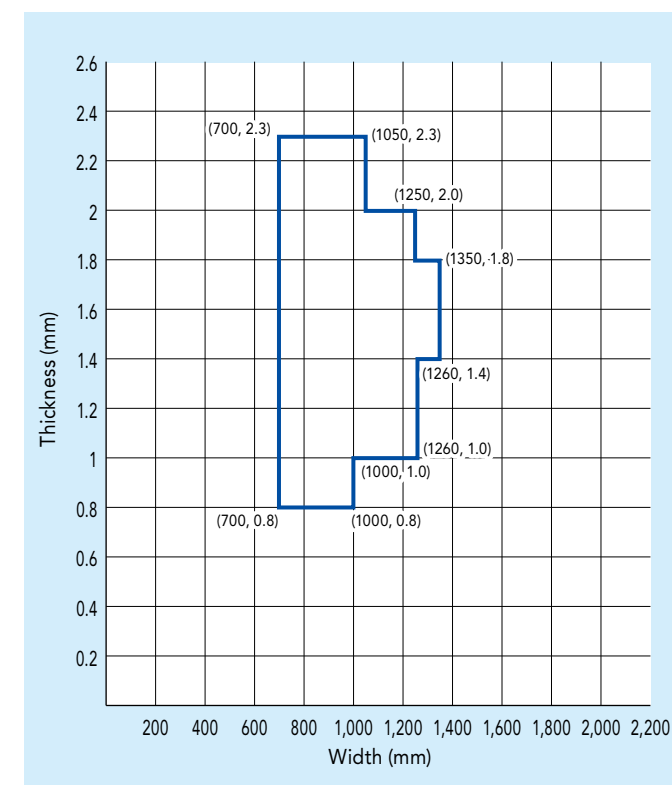
●NSC390N NSC390R NSC440N NSC440R



●NSC540D NSC590D



●NSC1180D



Available in coil only by option fee. (Option fee is required for a manufacturing arrangement.)

Precautions for Use

Cold-Rolled Steel Sheets and Coils are produced in a wide range of grades, each having its own unique characteristics. Selection of the right grade, therefore, is essential for the most economical production of high-quality end products. Nippon Steel & Sumitomo Metal can help customers choose the grade best suited for each application. We are also ready to cooperate with customers by offering optimal technical and production advice.

1. Painting

In most cases, Cold-Rolled Steel Sheets and Coils are used after painting for the purpose of ornamentation as well as for protection against rusting. It is therefore recommended that the most suitable paint and painting method be selected with careful consideration given to the shape of the end product and the environment in which it will be used.

● Painting Methods

- a. Simple methods
Degreasing → Painting → Drying
 - b. Methods to be employed when special paint durability is required.
Degreasing → Chemical Treatment* → Painting → Drying
- * Phosphate film or wash primer

● Probable Causes of Faulty Paint Coating

- a. Inadequate degreasing
Optimal paint film cannot form on an inadequately degreased surface. Paint adherence and corrosion resistance will inevitably be poor.
- b. Insufficient chemical treatment
Adherence and corrosion resistance of the paint coating is also affected by insufficient chemical treatment. The effect of chemical treatment may also be impaired by humidity, resulting in an uneven tone of the chemical film applied or in its discoloration.
Since these two probable causes described in a and b are the major factors affecting paint results, the work must be done carefully.
- c. Insufficient water rinsing and drying after chemical treatment
In this case, the same results will occur as “a” and “b” mentioned above.
- d. Improper paint
Avoid paints with poor durability. For top coating, new synthetic resin paints are developed by numerous paint manufacturers. Please consult with them to make the best selection for your needs.

2. Plating

Cold-Rolled Steel Sheets and Coils are applied with oils for rust protection. The lubricant used in the press working may also remain on the surface. All traces of such oil and impurities present on the surface must be removed before beginning the plating operations. Degreasing methods to achieve that end include those using emulsions, alkali cleaners, etc. Of these, alkali cleaning is the most widely employed because of its economy and ease of handling. Caustic soda, carbonic soda, and silicate soda are the most commonly used alkali cleaners. Time, temperature, and agitation are the determining factors in degreasing. A surface activator added to the solution usually improves degreasing effect.

● Pickling

Oxide film and rust on the sheet’s surface must be removed by pickling. Warm sulfuric acid or hydrochloric acid are usually used as pickling solutions. Overpickling may cause roughness and/or hydrogen embrittlement. Underpickling on the other hand, may lead to poor plating. Satisfactory pickling is usually achieved by adding the proper amount of inhibitor to the solution and establishing conditions that permit slight overpickling. When an acid solution is used for plating, pickling may be omitted if surface conditions of the sheet permit.

● Method of Checking Surface Cleanness

- The following methods are widely employed on the spot to check the surface cleanness of the sheets.
- a. Judgments based on water behavior on the sheet surface
The cleanness of a steel sheet surface may be checked by the water spray test, although judgment can be difficult when water drops are too small. In the atomizer test, water is sprayed onto a test specimen inclined 5 to 10 degrees from vertical. The spray must be applied in proper amounts and in such a way that the clean and stained areas will be distinguishable from each other through the patterns made by the atomized water. The sensitivity of the atomizer test is proportionate to the size of the water drops, i.e., the smaller the better.
 - b. Other methods include those based on the results of test plating.

3. Rust Prevention

In order to provide maximum protection against rusting and at the same time facilitate degreasing, Cold-Rolled Steel Sheets and Coils are lightly and uniformly treated with an oil that is low in viscosity and easy to remove but still provides superior protection against rusting. Since the sheets are only lightly oiled, they may rust if left exposed for an inordinately long time after unpacking. Unpacked sheets, therefore, should be used promptly. When production conditions make it necessary to keep the unpacked or fabricated sheets exposed for a certain period of time before painting or plating, the following precautions should be taken.

- a. Since humidity over 70 percent usually accelerates the formation of rust, sheets should be kept in a place of less than 60 percent humidity.
- b. Air pollution also affects rusting. Hygroscopic substances such as hydrochloric acid gas, ammonium chloride gas, and seawater salt particles accelerate rust even when humidity is of 60 percent or less or temperatures are above the dew point.
- c. Dust and contaminants present on the surface tend to break the protective oil film, produce local galvanic activity with the base metal, and cause rust.

4. Stretcher Strains and Aging

When a rimmed steel sheet is subjected to moderate press forming, wrinkles may appear on the surface. These markings are known as “stretcher strains”. If steel sheets are properly cold-reduced during the temper process with about 1 percent of draft after annealing, stretcher strains will not appear for a certain period of time. However, under certain conditions stretcher strains will appear one week after temper rolling. Factors causing these conditions include temperature, solid solution carbon and nitrogen content in the steel, and the degree of forming of parts. When the formation of stretcher strains is considered likely, the sheet is normally roller-leveled before forming. It is advisable to use roller-leveled material within 24 hours of roller leveling, because roller leveling is effective against aging (a state in which stretcher strains appear) for a shorter time than temper rolling.

5. Welding

Manufacture of satisfactory end products greatly depends on the selection of proper welding methods and welder skills. Steel sheets may be welded by one of the following methods. The proper method should be determined on the basis of the required appearance and strength of the end products as well as economic considerations.

● Gas Welding

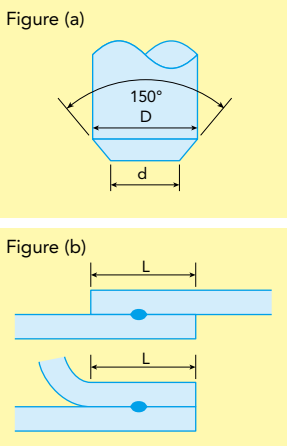
For oxyacetylene welding, the highest possible grade of acetylene should be used. For this method, JIS Specification Z 3201 (Gas Welding Rods for Mild Steel) rods are recommended.

● Submerged-Arc Welding

Of the electrodes produced to JIS Specification Z 3211 (Covered Electrodes for Mild Steel), high oxygenation titania or lime titania types are recommended because of their capacity of producing excellent bead appearance and penetration.

● Resistance Welding

- a. Spot welding
Adequate weld strength cannot be obtained if the welded joint is not in nugget form. Standard spot welding conditions for mild steel sheets are shown in the table below for reference.
- b. Seam welding
Seam welding may be considered a variation of continuous spot welding. Good seam welds are obtained with a current 1.5 to 2.0 times greater and pressure 1.2 to 1.6 times greater than those for spot welding.



6. Coils

The use of coil is generally more advantageous than sheet for improving yield and maintaining continuous and automated operations in working. Coil is the material from which sheet is cut, and possesses characteristics which differ from those of sheet. Thus the effective use of coil improves productivity.

● Use of Coils

Coils may contain defective portions attributable to surface imperfections, and thus it is necessary to conduct inspection, selection and rectification. Off-gauge portions at both edges of coils are removed as a rule, but off-gauge portions at welds and their vicinities may be included, for which due attention should be paid. The material quality of coil is not different from that of sheet.

Spot Welding Conditions for Mild Steel Sheets (Examples)

Sheet Thickness ⁽¹⁾		Electrode ⁽²⁾		Minimum Pitch ⁽³⁾ (mm)	Minimum Lap ⁽⁴⁾ (mm)	Optimum Condition (Class A)					Medium Condition (Class B)					Standard Condition (Class C)				
(mm)	(in)	d (mm)	D min (mm)			Time ⁽⁵⁾ (s)	Pressure (kg)	Current (A)	Weld Diameter (mm)	Strength ⁽⁶⁾ ±14% (kg)	Time ⁽⁵⁾ (s)	Pressure (kg)	Current (A)	Weld Diameter (mm)	Strength ⁽⁶⁾ ±14% (kg)	Time ⁽⁵⁾ (s)	Pressure (kg)	Current (A)	Weld Diameter (mm)	Strength ⁽⁶⁾ ±20% (kg)
0.6	0.024	4.0	10	10	10	7	150	6,600	4.7	300	13	100	5,500	4.3	280	26	50	4,300	4.0	225
0.8	0.031	4.5	10	12	12	9	190	7,800	5.3	440	15	125	6,500	4.8	400	30	60	5,000	4.6	355
1.0	0.040	5.0	13	18	18	10	225	8,800	5.8	610	20	150	7,200	5.4	540	36	75	5,600	5.3	530
1.2	0.048	5.5	13	20	20	12	270	9,800	6.2	780	23	175	7,800	5.8	680	40	85	6,100	5.5	650
1.6	0.062	6.3	13	27	27	16	360	11,500	6.9	1,060	30	240	9,100	6.7	1,000	52	115	7,000	6.3	925
2.0	0.078	7.0	16	35	35	20	470	13,300	7.9	1,450	36	300	10,300	7.6	1,370	64	150	8,000	7.1	1,305
3.2	0.125	9.0	16	50	50	32	820	17,400	10.3	3,100	60	500	12,900	9.9	2,850	105	260	10,000	9.4	2,665

(1) These welding materials indicated in the table are lightly oiled Cold-Rolled Steel Sheets and Coils with tensile strength ranging from 290 to 310 N/mm². The surface to be welded must be free from oxides, paint, dust, and other impurities.
(2) RWMA Class 2 electrodes (75% specific conductance and Rockwell B75 hardness) are to be used. The end profile is as illustrated in Figure (a) and permissible variations in d are ± 0.4mm.
(3) The minimum pitch indicates the limit to which the diversion effect of the neighboring spot may be ignored for practical purposes. When it is necessary to perform welding at shorter pitches, the current value must be increased accordingly to compensate for the diversion effect.
(4) The minimum lap equals the area indicated by “L” in Figure (b).
(5) Welding time is expressed in terms of the number of cycles when the frequency of the power supply is 60 Hz. As this means that 10 Hz equal one-sixth of a second, when welding is carried out on 50 Hz power the welding time must be five-sixths of the figure in the table above.
(6) Strength refers to unit shear strength per spot weld, and the percentage refers to permissible variation.
(7) When welding sheets are different in thickness, the conditions for the thinner sheet may prevail, provided that the thickness ratio is 1:3 or less and that the current flow is in the direction from the thinner to the thicker sheet. The conditions in the table may also be applied to lap welding of up to four sheets (the total number of sheets thus welded should not exceed four times the thickness of one under any circumstances).

Packaging and Labeling

Our products are packaged to prevent any damages possibly caused by normal handling practices or storage conditions before actual use after unpacking. Package marking indicating the product contents is attached to the outer package. Also an inspection card, which guarantees the product, is enclosed in the product. These cards are used to confirm the product of delivery after it is received. The items recorded on the cards are listed below.

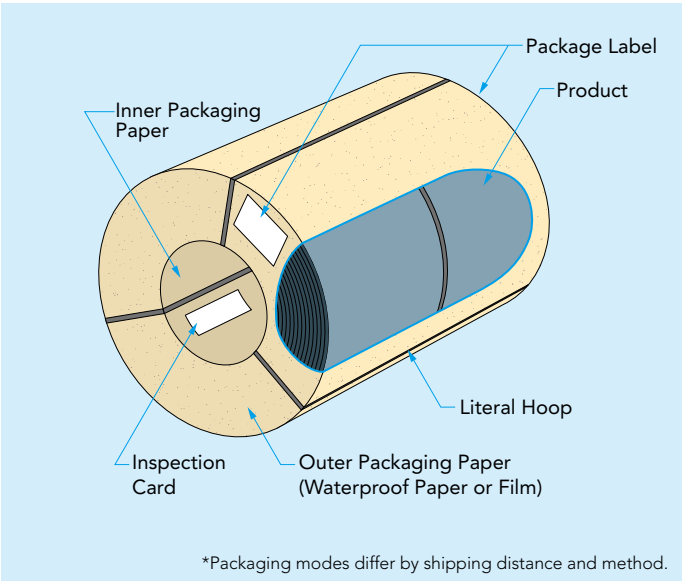
1. Examples of Contents Marked on Package Label and Package Card

Item Name	Marking Conditions		Marking Method and Content Examples									
	Normal Marking	Marking by User Designation										
Brand Name	○		Marking with prescribed brand name.									
Inspector Mark	○		First class									
JIS Certification Mark	*○		㊦ is marked on the label of products authorized to designate the JIS-certification mark. No marking is done on the package card.									
Specification Symbol	○		Marking orders are as follows. The item that does not fall under marking is not marked, and is deleted to put to the left.									
			<div><div>JIS G3141 SPCC : S D N</div><div><div><div>①</div><div>②</div><div>③</div><div>④</div><div>⑤</div><div>⑥</div><div>⑦</div></div></div></div> <div>①… Abbreviation of standard name, code number, code abbreviation, etc.</div> <div>②… Classification of vibration-damping sheet resins. Marked only for VIBLESS.</div> <table><tr><td>Classifications</td><td>General</td><td>Weldable</td></tr><tr><td>Room-Temperature Use</td><td>N</td><td>W</td></tr><tr><td>Medium Temperature Use</td><td>M</td><td>X</td></tr><tr><td>High Temperature Use</td><td>H</td><td>Y</td></tr></table> <div>③… Tempering Symbol S: Standard tempering M: Non-annealing 1: Full hardness 2: 1/2 hardness 4: 1/4 hardness 8: 1/8 hardness</div> <div>④… Surface-finish symbol D: Dull finish B: Bright finish</div> <div>⑤… Surface treatment symbol (marked only when surface treatment is specified) X-coat of lubricant oil film removal type X-coat of lubricant oil film non-removal type UV-coat of highly lubricant oil film removal type, white color UV-coat of highly lubricant oil film non-removal type, white color UV-coat of highly lubricant oil film non-removal type, black color M: Untreated B: Phosphate treated C: Electrolytic chromate treated</div> <div>⑥… Oil symbol H: Heavily oiled N: Normally oiled L: Lightly oiled X: Unoiled</div> <div>⑦… Allowable thickness tolerance classification symbol Marked only for JIS G 3311 Cold-Rolled Steel Strip. Not marked where the product specification is non-standard and the allowable thickness tolerance is specified. A: Allowable tolerance A B: Allowable tolerance B</div>	Classifications	General	Weldable	Room-Temperature Use	N	W	Medium Temperature Use	M	X
Classifications	General	Weldable										
Room-Temperature Use	N	W										
Medium Temperature Use	M	X										
High Temperature Use	H	Y										
Coating	*○		Marking in cases of VIBLESS, when either the obverse or reverse side is surface treated steel sheet. Unit numbers are marked in parentheses after the item name.									
Size	○		Ordered size (thickness × width × length) is marked. For coil, “COIL” (“C” on the inspection card) is marked in place of length.									
Inspection Side		*○	Marked if reverse side use or both side use is designated.									
Net Mass	○		The net mass of the product is marked.									
Sheet	*○		The actual number of sheets contained.									
Coils	*○		Marked only when two or more hoops are bundled.									
Case No.		*○	Marked only for designated materials labeled with case numbers.									
Inspection No.	○		Marked with the unit inspection number for each shipped product.									
Coil No.	○		Marked with the production lot unit coil number.									
Production Date	○		Always marked except for materials designated not to be marked.									
User Name	○		Marked on the label.									
Maker’s Name	○		Nippon Steel & Sumitomo Metal Corporation									
Works	○		(Location Name) Works									

○ : Marked unconditionally
*○ : Marked when marking method and indication of contents are conditional

2. Packaging Sample

Coil Paper Without Inner/Outer Rings or Film Packaging



3. Package Label Sample

COLD ROLLED STEEL SHEETS		First Class ㊦
SPECIFICATION		
JIS G3141 SPCC:S D N		
SIZE		
0.9 X 914 X C		
NET MASS (THEO)		
4.700KG		
COIL NO.		INSPECTION NO.
701255120		1120077
PRODUCTION DATE		
2012-10-01		
NIPPON STEEL & SUMITOMO METAL ○○WORKS		

Reference

1. Conversion Table for Hardness (JIS G 3141)

Hardness Conversion Table from HR30T to HRB

HR30T	Conversion HRB	HR30T	Conversion HRB	HR30T	Conversion HRB	HR30T	Conversion HRB
35.0	28.1	47.0	46.0	59.0	63.9	71.0	81.9
36.0	29.6	48.0	47.5	60.0	65.4	72.0	83.4
37.0	31.1	49.0	49.0	61.0	66.9	73.0	84.9
38.0	32.5	50.0	50.5	62.0	68.4	74.0	86.4
39.0	34.0	51.0	52.0	63.0	69.9	75.0	87.9
40.0	35.5	52.0	53.5	64.0	71.4	76.0	89.4
41.0	37.0	53.0	55.0	65.0	72.9	77.0	90.8
42.0	38.5	54.0	56.5	66.0	74.4	78.0	92.3
43.0	40.0	55.0	58.0	67.0	75.9	79.0	93.8
44.0	41.5	56.0	59.5	68.0	77.4	80.0	95.3
45.0	43.0	57.0	60.9	69.0	78.9	81.0	96.8
46.0	44.5	58.0	62.4	70.0	80.4	82.0	98.3

According to ASTM E140 Table 2. Interpolation method is applied for hardness not listed in the ASTM table.

Hardness Conversion Table from HR15T to HRB

HR15T	Conversion HRB	HR15T	Conversion HRB	HR15T	Conversion HRB	HR15T	Conversion HRB
70.0	28.8	76.0	47.3	82.0	65.8	88.0	84.3
70.5	30.3	76.5	48.8	82.5	67.3	88.5	85.8
71.0	31.9	77.0	50.4	83.0	68.8	89.0	87.3
71.5	33.4	77.5	51.9	83.5	70.4	89.5	88.9
72.0	35.0	78.0	53.4	84.0	71.9	90.0	90.4
72.5	36.5	78.5	55.0	84.5	73.5	90.5	92.0
73.0	38.0	79.0	56.5	85.0	75.0	91.0	93.5
73.5	39.6	79.5	58.1	85.5	76.6	91.5	95.0
74.0	41.1	80.0	59.6	86.0	78.1	92.0	96.6
74.5	42.7	80.5	61.1	86.5	79.6	92.5	98.1
75.0	44.2	81.0	62.7	87.0	81.2	93.0	99.7
75.5	45.7	81.5	64.2	87.5	82.7		

According to ASTM E140 Table 2. Interpolation method is applied for hardness not listed in the ASTM table.

Hardness Conversion Stable from HV to HRB

HV	Conversion HRB	HV	Conversion HRB	HV	Conversion HRB	HV	Conversion HRB
85	41.0	115	65.0	145	76.6	175	86.1
90	48.0	120	66.7	150	78.7	180	87.1
95	52.0	125	69.5	155	79.9	185	88.8
100	56.2	130	71.2	160	81.7	190	89.5
105	59.4	135	73.2	165	83.1	195	90.7
110	62.3	140	75.0	170	85.0	200	91.5

According to SAE J417 Table 1. Interpolation method is applied for hardness not listed in the SAE table.

1. This table is an excerpt from JIS G 3141. The conversion table does not provide precise values because there are unavoidable effects on these values attributable to size, mass, chemical composition, and heat treatment method.
2. Hardness Scales
Rockwell B Scale.....1/16" steel ball used: load: 100kg
Rockwell superficial 30-T Scale.....1/16" steel ball used: load: 30kg
Vickers hardness.....Diamond pyramids with apex angle of 136°used: load: 5-50kg

2. Table on Mass per Sheet

Thickness mm	Width x Length	762× 1,829	762× 2,134	762× 2,438	672× 2,743	762× 3,048	914× 1,829	914× 2,134	914× 2,438	914× 2,743	914× 3,048
	Area m²	1,394	1,626	1,858	2,090	2,323	1,672	1,950	2,228	2,507	2,786
	Unit Mass kg/m²	Mass Per Sheet kg	Mass Per Sheet kg	Mass Per Sheet kg	Mass Per Sheet kg	Mass Per Sheet kg	Mass Per Sheet kg	Mass Per Sheet kg	Mass Per Sheet kg	Mass Per Sheet kg	Mass Per Sheet kg
0.15	1.178	1.64	1.92	2.19	2.46	2.74	1.97	2.30	2.62	2.95	3.28
0.19	1.492	2.08	2.43	2.77	3.12	3.47	2.49	2.91	3.32	3.74	4.16
0.20	1.570	2.19	2.55	2.92	3.28	3.65	2.63	3.06	3.50	3.94	4.37
0.25	1.963	2.74	3.19	3.65	4.10	4.56	3.28	3.83	4.37	4.92	5.47
0.30	2.355	3.28	3.83	4.38	4.92	5.47	3.94	4.59	5.25	5.90	6.56
0.35	2.748	3.83	4.47	5.11	5.74	6.38	4.59	5.36	6.12	6.89	7.66
0.40	3.140	4.38	5.11	5.83	6.56	7.29	5.25	6.12	7.00	7.87	8.75
0.50	3.925	5.47	6.38	7.29	8.20	9.12	6.56	7.65	8.74	9.84	10.9
0.60	4.710	6.57	7.66	8.75	9.84	10.9	7.88	9.18	10.5	11.8	13.1
0.70	5.495	7.66	8.93	10.2	11.5	12.8	9.19	10.7	12.2	13.8	15.3
0.80	6.280	8.75	10.2	11.7	13.1	14.6	10.5	12.2	14.0	15.7	17.5
0.90	7.065	9.85	11.5	13.1	14.8	16.4	11.8	13.8	15.7	17.7	19.7
1.00	7.850	10.9	12.8	14.6	16.4	18.2	13.1	15.3	17.5	19.7	21.9
1.20	9.420	13.1	15.3	17.5	19.7	21.9	15.8	18.4	21.0	23.6	26.2
1.40	10.99	15.3	17.9	20.4	23.0	25.5	18.4	21.4	24.5	27.6	30.6
1.60	12.56	17.5	20.4	23.3	26.3	29.2	21.0	24.5	28.0	31.5	35.0
2.00	15.70	21.9	25.5	29.2	32.8	36.5	26.3	30.6	35.0	39.4	43.7
2.30	18.06	25.2	29.4	33.6	37.7	42.0	30.2	35.2	40.2	45.3	50.3
2.60	20.41	28.5	33.2	37.9	42.7	47.4	34.1	39.8	45.5	51.2	56.9
2.90	22.77	31.7	37.0	42.3	47.6	52.9	38.1	44.4	50.7	57.1	63.4
3.20	25.12	35.0	40.8	46.7	52.5	58.4	42.0	49.0	56.0	63.0	70.0

Table on Mass per Sheet

Thickness mm	Width x Length	1,219× 1,829	1,219× 2,438	1,219× 2,743	1,219× 3,048	1,524× 1,829	1,524× 2,438	1,524× 3,048	1,524× 3,658	1,829× 1,829	1,829× 2,438	1,829× 3,048	1,829× 3,658
	Area m ²	2,230	2,972	3,344	3,716	2,787	3,716	4,645	5,575	3,345	4,459	5,575	6,690
	Unit Mass kg/m ²	Mass Per Sheet kg	Mass Per Sheet kg	Mass Per Sheet kg	Mass Per Sheet kg	Mass Per Sheet kg	Mass Per Sheet kg	Mass Per Sheet kg	Mass Per Sheet kg	Mass Per Sheet kg	Mass Per Sheet kg	Mass Per Sheet kg	Mass Per Sheet kg
0.15	1.178	2.63	3.50	3.94	4.38	3.28	4.38	5.47	6.57	3.94	5.25	6.57	7.88
0.19	1.492	3.33	4.43	4.99	5.54	4.16	5.54	6.93	8.32	4.99	6.65	8.32	9.98
0.20	1.570	3.50	4.67	5.25	5.83	4.38	5.83	7.29	8.75	5.25	7.00	8.75	10.5
0.25	1.963	4.38	5.83	6.56	7.29	5.47	7.29	9.12	10.9	6.57	8.75	10.9	13.1
0.30	2.355	5.25	7.00	7.88	8.75	6.56	8.75	10.9	13.1	7.88	10.5	13.1	15.8
0.35	2.748	6.13	8.17	9.19	10.2	7.66	10.2	12.8	15.3	9.19	12.3	15.3	18.4
0.40	3.140	7.00	9.33	10.5	11.7	8.75	11.7	14.6	17.5	10.5	14.0	17.5	21.0
0.50	3.925	8.75	11.7	13.1	14.6	10.9	14.6	18.2	21.9	13.1	17.5	21.9	26.3
0.60	4.710	10.5	14.0	15.8	17.5	13.1	17.5	21.9	26.3	15.8	21.0	26.3	31.5
0.70	5.495	12.3	16.3	18.4	20.4	15.3	20.4	25.5	30.6	18.4	24.5	30.6	36.8
0.80	6.280	14.0	18.7	21.0	23.3	17.5	23.3	29.2	35.0	21.0	28.0	35.0	42.0
0.90	7.065	15.8	21.0	23.6	26.3	19.7	26.3	32.8	39.4	23.6	31.5	39.4	47.3
1.00	7.850	17.5	23.3	26.3	29.2	21.9	29.2	36.5	43.8	26.3	35.0	43.8	52.5
1.20	9.420	21.0	28.0	31.5	35.0	26.3	35.0	43.8	52.5	31.5	42.0	52.5	63.0
1.40	10.99	24.5	32.7	36.8	40.8	30.6	40.8	51.0	61.3	36.8	49.0	61.3	73.5
1.60	12.56	28.0	37.3	42.0	46.7	35.0	46.7	58.3	70.0	42.0	56.0	70.0	84.0
2.00	15.70	35.0	46.7	52.5	58.3	43.8	58.3	72.9	87.5	52.5	70.0	87.5	105
2.30	18.06	40.3	53.7	60.4	67.1	50.3	67.1	83.9	101	60.4	80.5	101	121
2.60	20.41	45.5	60.7	68.3	75.8	56.9	75.8	94.8	114	68.3	91.0	114	137
2.90	22.77	50.8	67.7	76.1	84.6	63.5	84.6	106	127	76.2	102	127	152
3.20	25.12	56.0	74.7	84.0	93.3	70.0	93.3	117	140	84.0	112	140	168

3. Coil Width-Mass Curves for Coils



Inside Diameter: 508 mm (20 in.) The coil space factor is assumed to be 100%.

Ordering Information

When placing an order, check the following items according to the intended use.

Specification	Cold-Rolled Steel Sheets and Coils are produced in a wide range of grades satisfying both JIS and Nippon Steel & Sumitomo Metal specifications. Select the specifications best suited for the intended use, degree of fabrication, method of fabrication and other factors. Inquire if any questions arise.
Size	Thickness varies in increments of 0.1 mm as a rule. This may be reduced to increments of 0.05 mm in special cases. Width and length may be specified at increments of 1 mm.
Packaging Mass	Specify the packaging mass based on unloading capacity and working conditions. Cut sheets: Normally, 2 tons or more are standard. Coils: Normally available from 5 to 20 tons. Specify the maximum weight (and the minimum weight if necessary).
Coil Inside/ Outside Diameter	For coils, the inside diameters of 508 mm (20 inches) or 610 mm (24 inches) are standard. Specify the maximum outside diameter acceptable, if necessary.
Temper Grade	Specify the “standard temper” or select one from among the “four hardness grades”.
Surface Finish	Specify either “dull finish” or “bright finish”.
Oiling	Specify either “oiled” or “unoiled”. Normally, rust-prevention “oiled” products are produced.
Reversal Use	Appearance quality is normally guaranteed for the outside surface of coils. If the guaranteed side is to be the reverse side of the end product, or if both sides are to be the face sides of the end product, please specify so beforehand.
Edge Finishing	Specify “slit edge” based on conditions of use. Slit edges are recommended especially if the delivered product will be used as rolled and without further processing, thus requiring edge finishing, or when exacting width tolerance is required.
Weld Portions	Cold-Rolled Steel Sheets and Coils may contain welds made in the pickling line. Since such welds may sometimes be hard, vary in thickness or be detrimental to use, it is recommended that they be removed at the customer’s shop. If such removal is difficult, specify “no weld portion”. In such cases, however, the available coil mass will be limited. If marking of weld portions is required, specify so beforehand.
Applications	Nippon Steel & Sumitomo Metal manufactures our steel products with adequate quality control so that the products comply with the intended use as indicated in the customer’s order. Therefore, we ask customers to clearly specify the names of the uses/applications and conditions pertaining to the intended methods of process.
Other	Dimensional accuracy, shapes and other requirements are usually within the ranges of JIS Table A. However, assembling accuracy, component accuracy and other conditions may require more exacting specifications. In such cases, please clearly specify about the required specifications beforehand.